FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

Nov. 29 ... "The Development of High-Speed Aircraft," by Major R. H. Mayo, O.B.E., F.R.Ae.S., at the Royal Society of Arts.

Nov. 30 .... "The Result of Twelve Years' Welded Tube Construction and the Development of Cantilever Wings," by A. H. G. Fokker, before, I.Ae.E.

Dec. 1 .... Entries close for French Aero Engine Competition

Dec. 5 .... R.A.F. Wireless Re-union.

Dec. 13 .... "Air Strategy," by Wing Cmdr. Edmonds, before R.Ae.S.

Dec. 14 .... "Leader Cable Systems for Electrical Steering of Aeroplanes," by J. Gray, before I.Ae.E.

1924

Jan. 9 .... "Water-Cooled Aero Engines," by A. J. Rowledge, before Inst. of Automobile Engineers

Jan. 10 .... "Materials from the Aeronautical Point of View," by Dr. Aitchison and Mr. North before R.Ae.S.

Jan. 24 .... "Fabric and Dopes," by Dr. Ramsbottom, before R.Ae.S.

Feb. 7 .... "Airmanship at Sea," by Sqd.-Ldr. Maycock, O.B.E., R.A.F., before R.Ae.S.

Feb. 21 .... "Aerial Photography and Survey," by Mr. H. Hamshaw Thomas, before R.Ae.S.

EDITORIAL COMMENT.

FROM the number of letters that have reached this office during the last few weeks it is evident that there is a very widespread interest in the latest phase of aviation, *i.e.*, light aeroplane flying, but that in very many instances those who have written us on the subject would prefer, either for reasons of economy or because of a desire to do some actual constructional work, to build their own machines.

Amateur Construction of Light 'Planes

The original design of an aeroplane, aerodynamic as well as structural, is not a matter to be undertaken lightheartedly by an amateur; nor is the selection of materials and the proper working of these materials. To let amateurs design and build their own machines without any inspection or supervision would be against the best interest of the movement, and, although we are not in favour of too much Government control, we do think that in this matter the greatest caution is necessary.

The question then arises: Is it possible to find other means of reducing the initial cost of light 'planes without sacrificing essential safeguards? In an article published in this issue of FLIGHT we give some notes on the adoption of the "knock-down" principle used in boat-building, outlining how such a scheme might be expected to work. In theory the system has the appearance of offering possibilities, but after consultation with a number of aircraft constructors, who are almost unanimous in expressing the view that the drawbacks attending such a scheme are such as to make the risk greater than most firms would care to undertake, the conclusion reached is that, at present, at any rate, it would be unwise to recommend its adoption. It seems not unlikely that in a year's time or so the scheme may be revived, when more experience has been gained by our manufacturers.

Among the suggestions put forward in the article referred to, calculated to popularise light 'plane flying, there are two that seem to have considerable merit. One is that the Air Ministry should order a considerable number of light 'planes for Service training purposes, the idea being that by ordering in quantities the cost of machines would be reduced.

The second suggestion refers to the formation of light 'plane clubs and associations.

With regard to the former suggestion, it is to be feared that the Air Ministry will not be able to do much for the present. Prizes are being offered for competition next year, and it is evident that in official circles the view is held that a two-seater light 'plane is required for Service purposes. It is, therefore, very unlikely that the Air Ministry will place substantial orders until after next year's competitions for two-seaters. Consequently there seems to be little likelihood of the price of single-seaters being reduced by this means.

With the suggestion that light 'plane clubs should be formed we are, as previously expressed, in entire agreement, and already the Association formed at Addlestone has shown the way. This club financed the building of one of the monoplanes entered at Lympne, and the prizes won must have considerably more than paid for the cost of the machine. It is not, of course, to be expected that all associations and clubs formed could count on doing as well, but, on the other hand, there is little doubt that next summer will see a considerable number of flying meetings for light 'planes, somewhat on the lines of, but more elaborate than, the very successful meeting held at Hendon recently. Even if prizes to be won at these races are not very large, they do offer an incentive, and associations possessing one or two light 'planes could get quite a good deal of fun out of entering their machines.

It would not be a bad plan if the Air Ministry were to give some little financial assistance to such associations, either by offering to pay a certain percentage of the cost of each machine purchased by such associations, or by placing orders for small batches of machines with manufacturers and then selling them at cost price to recognised clubs or associations. In fact, apart from light 'plane clubs there does not seem to be any reason why the Air Ministry should not order a certain number of single-seaters, in batches sufficiently large to bring down the initial cost, and then sell them to Service pilots who wished to run their own private machines. This would encourage Service pilots to do as much flying as possible, which would be to the very direct benefit of the R.A.F., and as these machines would be intended for the use of those who were already pilots, and not for beginners, the fact that they were single-seaters would be no serious matter. To us it seems that in the future both single-seaters and two-seaters will be required for Service purposes, the former for enabling pilots to "keep their hands in" and the latter for instructional purposes. We therefore recommend the suggestion to the attention of the aviation authorities, with the pious hope that something may be done at once without waiting for the result of the 1924 competitions.

Royal Aeronautical Society

THE lecture by Squadron Leader Maycock, O.B.E., R.A.F., on "Airmanship at Sea," has been postponed to Thursday, February 7, 1924.

Major R. H. Mayo, O.B.E., F.R.Ae.S., will read a paper on "The Development of High-Speed Aircraft" at 5.30 p.m. on Thursday, November 29, at the Royal Society of Arts.

The East Malling Accident

THE Air Ministry announces that as a result of the investigation into the circumstances of the accident to the French aircraft F-A.E.C.B., which occurred at East Malling on August 27 last, the Inspector of Accidents has arrived at the following conclusions: (*a*) That the accident was due to the aircraft stalling near the ground while the pilot was attempting to make a forced landing caused by a fracture of the starboard engine crankshaft; (*b*) that the pilot failed to maintain sufficient flying speed to render the aero controls effective to overcome the instability and tail heaviness induced in the aircraft by a movement of passengers from the front to rear cabin; (*c*) that nothing in the nature of panic occurred amongst the occupants of the aeroplane at any time during the flight.

Sadi Holds the Altitude Record

THE world's altitude record of 11,145 metres (36,600 feet), established by Sadi Lecointe recently, has been homologated, and thus Sadi is holder of this record once more. In addition he wins the Coupe Rateau for greatest height attained without supercharger.

Our Air Mails

A NEW edition of the Air Mail leaflet has been issued by the P.M.G., copies of which may be obtained, free of charge, on application at any head or branch post office. This leaflet gives much information on the subject of air mails from this country, such as, for example: conditions of posting, routes and fees, table of services showing advantages offered, latest times of posting, air parcel services, etc.

Capt. Barnwell Returns

WE are very glad to learn that Capt. F. S. Barnwell, who went out to Australia a couple of years ago, has now returned to this country. Capt. Barnwell's departure was a real loss to British aviation, and his return should once more place his very valuable services at the disposal of the industry. Capt. Barnwell was, of course, the originator of a long line of "Bristol" aeroplanes, of which the most famous is perhaps the "Bristol Fighter," which, although originally designed about the middle of the War, is still, in its modified form, one of the most successful machines of its type.

Английское правительство пред'явило С.С.С.Р наглый ультиматум. Во имя сохранения мира С.С.С.Р. вынужден итти на серьезные уступки. Крепите вооруженную силу Советской Республики, тогда покончим с уступками империалистам. СТРОЙТЕ КРАСНЫЙ ВОЗДУШНЫЙ ФЛОТ—сильнейшее оружие будущих войн. О.Л.В.Ф. в память об английском ультиматуме и в напоминание о нашем общем долге по укреплению вооруженных сил С.С.С.Р.—принимает всех граждан к созданию в складчину боевого отряда самолетов—„УЛЬТИМАТУМ" Покупайте жетоны О.Л.В.Ф. на взносы этого отряда!

"ULTIMATUM" AND A WARNING:

From the front cover of No. 3 of the Russian "Air Fleet Journal." The word under the cartoon is "Ultimatum," and the explanation following states (free translation) that the English Government presented Russia with a sudden ultimatum. To preserve peace the Russian Government had to make important concessions. Then appeal is made to the citizens thus: "Strengthen the military power of the Soviet Republic and that will end having to give concessions to Imperialistic Governments. Build up the Red Aerial Fleet for future warfare. The Soviet Government, in memory of this English ultimatum, therefore calls to all citizens to subscribe towards the creation of an efficient aerial fleet." We can only conjecture that the "HH'AA!" at the top is Soviet for "Ha, Ha!"

FLIGHT

THE NEW UDET COMMERCIAL MONOPLANE

A German Three-Seater of Very Clean Design

HITHERTO the Udet-Flugzeugbau of Munich have confined their attention to small machines mainly intended for school work or for sports flying. Now, however, they have definitely entered the ranks of the firms producing commercial aeroplanes, and their first machine, which was to have been shown at Gothenburg, has now been finished, and promises to be a very useful type. As the accompanying scale drawings indicate, the machine is of very "clean" design, in which external bracing has been entirely eliminated.

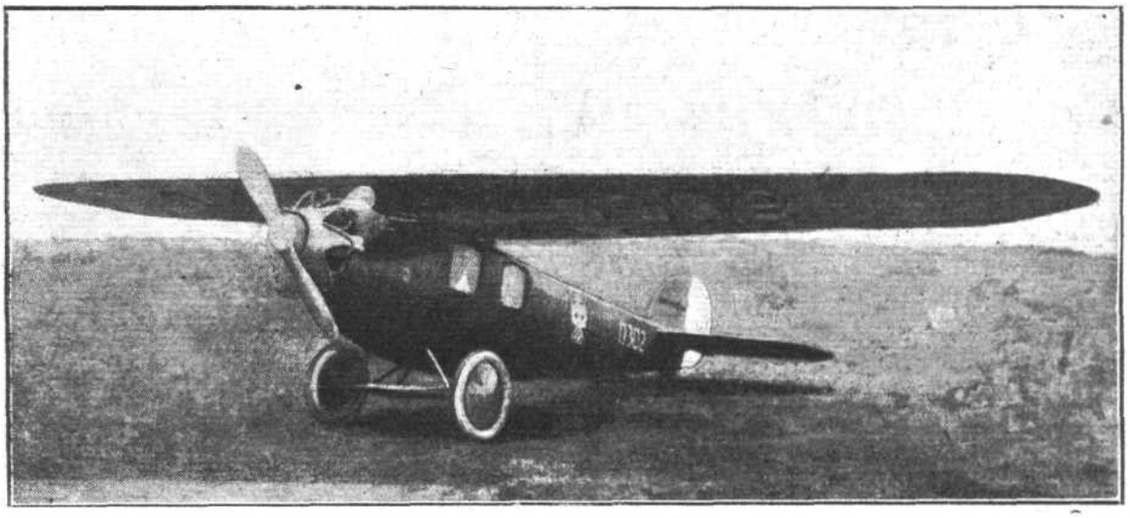
As distinct from previous Udet machines, the new commercial three-seater is a "high-wing" monoplane. In fact it might justifiably be termed a "parasol" monoplane, as the wing does not rest directly on the top of the fuselage, but is separated from it by a small gap, and is carried on four vertical struts. This arrangement of the wing was chosen for various reasons. The designer of the machine, Herr Ing. Hans Henry Herrmann, believes that by having a gap between the wing and the top of the fuselage the slipstream effect on the former is reduced. Another reason is that it has been found difficult to provide, in a machine with a very small cabin, sufficient ventilation to prevent air sickness. Consequently, in the Udet three-seater the cabin is not entirely covered in, an opening being left in the roof, underneath the wing. It is claimed that with this arrangement the ventilation of the cabin is all that could be desired, while at the same time it has been found that there is no draught.

Another advantage of the high-wing position is that it has been found possible to place the pilot's cockpit under the leading edge, so that it has not been necessary to cut out the latter. This is thought to have contributed to some extent towards the aerodynamic efficiency of the design, as generally speaking any openings or breaks in the centre-section wing curve have an adverse effect on the smoothness of the airflow.

The fuselage of the Udet three-seater is of oval section, and is covered with ply-wood. The shape of the body should be very good aerodynamically, although nowadays it does not always follow that a shape that is good by itself is necessarily also the best when brought close to another body. However in the Udet probably the gap between the fuselage and the wing tends to reduce the mutual interference effect. The 70 h.p. Siemens radial air-cooled engine is mounted on a swivel mount, so that the back of the engine is readily accessible for inspection or adjustments. By undoing two bolts the whole engine unit swings out, much in the manner first used in this country—and we believe patented—by Boulton and Paul, Ltd. In the Udet this idea has, however, been carried a step farther, as all the engine instruments and controls are mounted on the engine unit and removed with it. A similar arrangement was found in the Morane-Saulnier cabin monoplane exhibited at the last Paris Aero Show. As the pilot's cockpit is immediately aft of the engine mounting, and the instrument-board drops into its normal position when the engine plate is bolted up, there is no necessity to interfere with any throttle or ignition adjustments, and the only connection that has to be broken is the petrol pipe. It should be possible, by a suitable arrangement of the piping, to avoid even the disconnecting of this.

The accommodation provides seating for two passengers in addition to the pilot. Entrance to the cabin and pilot's cockpit is gained through a door on the port side. The front seat in the cabin is placed slightly to the right of the centre line, so as to enable the pilot to get past it to his cockpit, and the second passenger to pass to his seat behind the front one. The seats are comfortably upholstered, and both passengers face forward. As the wing is above the cabin the view through the side windows is particularly unrestricted, and by standing up the passengers can look over the edge of the opening in the roof of the cabin. Aft of the cabin, and communicating with it by a door, is a fairly large luggage compartment. It would seem somewhat difficult to get bulky luggage through the cabin on its way to this compartment, and a door in the side would appear to be advisable, especially as the journeys to be undertaken by a machine of this type will scarcely be of such long duration as to necessitate the passengers being able to get at their luggage during the voyage.

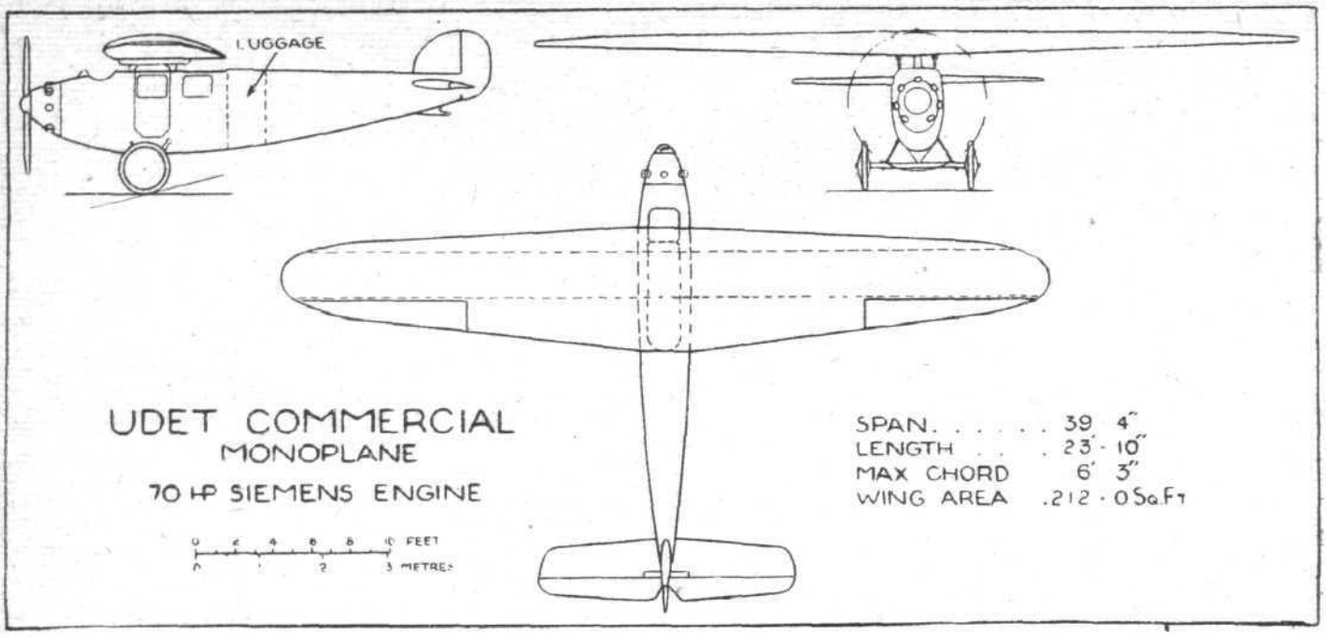
The monoplane wing of the Udet three-seater is of the pure cantilever type, and is of thick section, tapering both in chord and depth towards the rounded tips. It is constructed entirely in wood, the spars being of box section and ribs having three-ply webs and spruce flanges. The spars, it will be noticed, are parallel in plan view, so that at the centre section there is a considerable overhang both in front of and behind the spars, the distance between which is determined mainly by the chord of the tip section. As already stated, the wing tapers both in chord and thickness, the latter taper being approximately symmetrical in relation to the centre line of the spars, while the taper in plan is unsymmetrical, the leading edge being swept back 5° while the trailing edge is swept forward 7°. The leading edge is stiffened by a ply-wood capping extending to the front spar, the edges of this capping being of the "saw tooth" type, in which the points meet the centre line of the spar while the recesses lie on the wing ribs a short distance ahead of the spar. This form of nose stiffener was, we believe, first introduced by Fokker.



The Udet Three-Seater Commercial Monoplane: Three-quarter front view. The engine is a 70 h.p. Siemens, and the machine carries two passengers in addition to the pilot.

The wing is secured to the fuselage by four struts inserted in the latter, and having corner plates to provide stiffness without bracing in a vertical fore and aft plane. Laterally these struts do not appear to have any bracing whatever, the rigidity of the struts being apparently relied upon to take the place of the usual transverse bracing of a centre-section. The struts, it should be noted, remain in place on the fuselage, and the wing is dismantled by undoing four bolts securing the wing spars to the top of the struts. The ailerons are of approximately triangular plan form, with the maximum chord at the inner end. The wing section used is not, as might have been thought, one of the Göttingen or "tadpole" sections, but has a perfectly flat bottom camber.

The horizontal tail plane is of the trimming type, so as to allow of flying with or without passengers. While the main plane is set at no angle of incidence to the propeller shaft, the tail plane is normally set at an angle of + 2·3°, and is thus at a greater apparent angle than the main plane. The down-wash behind the high-lift centre section probably changes this into a slight negative actual angle.



THE UDET THREE-SEATER COMMERCIAL AEROPLANE : General arrangement drawings, to scale.

The undercarriage is of normal V-type in the first machine, but it is understood that a new type of chassis, offering less resistance and also slightly lighter, is being developed.

As the illustrations will show, the Udet three-seater is of good streamline shape, and looks an efficient design. It is claimed that the gliding angle is approximately 1 in 14, and this does not seem to be an unduly optimistic estimate. The parasite resistance has been reduced to a minimum, and the aspect ratio of the wing is high (approximately 8). The main characteristics of the Udet three-seater are as follows: Length, o.a., 7·28 m. (23 ft. 10 ins.); span, 12 m. (39 ft. 5 ins.); wing area, 18 sq. m. (194 sq. ft.); weight empty, 470 kgs. (1,033 lbs.); useful load, 330 kgs. (726 lbs.); total loaded weight, 800 kgs. (1,759 lbs.); engine, 70 h.p. Siemens, radial air-cooled; wing loading, 9·06 lbs./sq. ft.; power loading, 25·08 lbs./h.p.; maximum speed, 180 kms. (111·6 m.p.h.). As the fuel consumption is probably only about 6 gallons per hour, the Udet should do a matter of 20 miles per gallon of petrol, or a fuel cost per passenger carried of about ½*d.* per mile. Considering the restrictions under which the German designers are working, the Udet would appear to represent a really serious attempt to provide an economical aeroplane for use where the amount of traffic is small, or for use as a touring machine by the private owner-pilot.

THE ROYAL AERO CLUB OF THE U.K.

OFFICIAL NOTICES TO MEMBERS.

COMMITTEE MEETING

A MEETING of the Committee was held at the Royal Aero Club, 3, Clifford Street, W. 1, on Wednesday, November 14, 1923, when there were present: Lieut.-Col. F. K. McClean, A.F.C. (in the Chair), Group-Capt. F. W. Bowhill, C.M.G., D.S.O., R.A.F., Mr. Ernest C. Bucknall, Lieut.-Col. M. O. Darby, Lieut.-Col. John D. Dunville, C.B.E., Capt. D. G. Murray, Lieut.-Col. A. Ogilvie, C.B.E., Lieut.-Col. M. O'Gorman, C.B., Mr. F. Handley Page, Mr. T. O. M. Sopwith and the Secretary.

Election of Members.—The following new members were elected:—

Flying Officer Edward Leslie Barrington, R.A.F.
George Ernest Baxter.
Flight-Cadet Lionel Collings Beaumont, R.A.F.
Charles Walter Berry.
Flight-Lieut. Hugh Leonard Burton, R.A.F.
Flying Officer Irwin Napier Colin Clarke, R.A.F.
Squadron-Leader Sidney Mechen Cleverly, R.A.F.
Flying Officer Cyril Bertram Collins, R.A.F.
Flight-Lieut. Charles Beauvoir Dalison, R.A.F.
Paul J. Delalande.
Flight-Lieut. Arthur Leonard Fiddament, R.A.F.
Sir Arnold Babb Gridley, K.B.E.
Flying Officer H. A. Hamersley, R.A.F.
Squadron-Leader Cecil Hugh Hayward, R.A.F.
Flight-Lieut. Thomas Edward Barham Howe, R.A.F.
Flight-Lieut. Leon Joseph Killmayer, R.A.F.
Norman Lea.
Flying Officer Hugh Lewis Pingo Lester, R.A.F.
Air Commodore Charles Alexander Holcombe Longcroft, R.A.F.
Squadron-Leader Richard Beauchamp Maycock, R.A.F.
Wing-Commander Eric Roper Curzon Nanson, R.A.F.
Maurice Walter Piercey.
Sydney Elliott Preston.
Squadron-Leader Thomas Stanley Rippon, R.A.F.
Frank Eugene Robinson.
Pilot Officer Charles Forbes Sealy, R.A.F.
Flying Officer Edward Ewart Paull Smith, R.A.F.
Walter Stanhope-Spencer.
Flight-Lieut. David Arthur Stewart, R.A.F.
Frederick Tymms.
Flight-Lieut. Frederick Hubert Williams, R.A.F.

Honorary Member.—Capt. Silvio Scaroni, Italian Air Attaché.

Honorary Life Member.—Mr. Griffith Brewer was unanimously elected an Honorary Life Member of the Club.

Certificate of Performance (under the Competition Rules of the Royal Aero Club).—The following Certificate of Performance was granted to Messrs. D. Napier and Son, Ltd.:—*Type*: "Gloster-Napier." *Constructor*: Gloucestershire Aircraft Co., Ltd., Cheltenham. *Engine*: 450 h.p. Napier "Lion." *Place*: Waddon Aerodrome, Croydon. *Date*: August 6, 1923.

Aerial Derby, 1923

Performance.—*Distance*, 200 miles. *Time*, 1 h. 2 m. 23 s. *Speed*, 192·4 m.p.h.

Racing Committee.—The report from the Racing Committee was received and adopted.

The report included the following items:—

Light Aeroplane Demonstration at Hendon.
Light Aeroplane Competitions, 1924.
Air Ministry Amendments to the Regulations governing the issue and renewal of "A" Licences.

Private Pilots' Licences, Class "A."—Lieut.-Col. A. Ogilvie, C.B.E., reported that he and the Secretary had represented the Club at a Conference at the Air Ministry on October 30. The Air Ministry were proposing to introduce amendments to the Regulations governing the issue and renewal of "A" Licences, more particularly as regards recent flying experience, minimum hours of flying in the vicinity of an aerodrome to re-qualify, and medical examination. The Club's view that there was no occasion to vary the conditions at present in force, had been submitted to the Conference.

Light Aeroplanes.—It was decided to adopt the term "Light Aeroplane" in place of "Motor-Glider."

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

FLIGHT

THE AEROMARINE METAL-HULL FLYING BOAT

RECONSTRUCTED war-time aircraft have been used by the Aeromarine Airways in the U.S.A. since the beginning of their operations in 1920 with more or less success, yet these operations clearly indicated that for future use a more efficient, particularly from the point of maintenance and reserve power, flying boat would be needed.

The problem of development of a boat of this type was placed in the hands of the engineers of the Aeromarine 'Plane and Motor Company, Keyport, N.J., early in 1922. Preliminary work on the design and construction was immediately started. The boat to be replaced was the old converted H.S.-2L-six passenger, beach-hopping machine.

Beach-hopping requires a flying boat with a strong bottom, quick take off, good climb, and with sufficient fuel capacity for either short or long distance flights. The hull must be seaworthy as much of the flying is over open ocean, and the whole machine must be so constructed as to require as little maintenance as possible while anchored in a protected harbour.

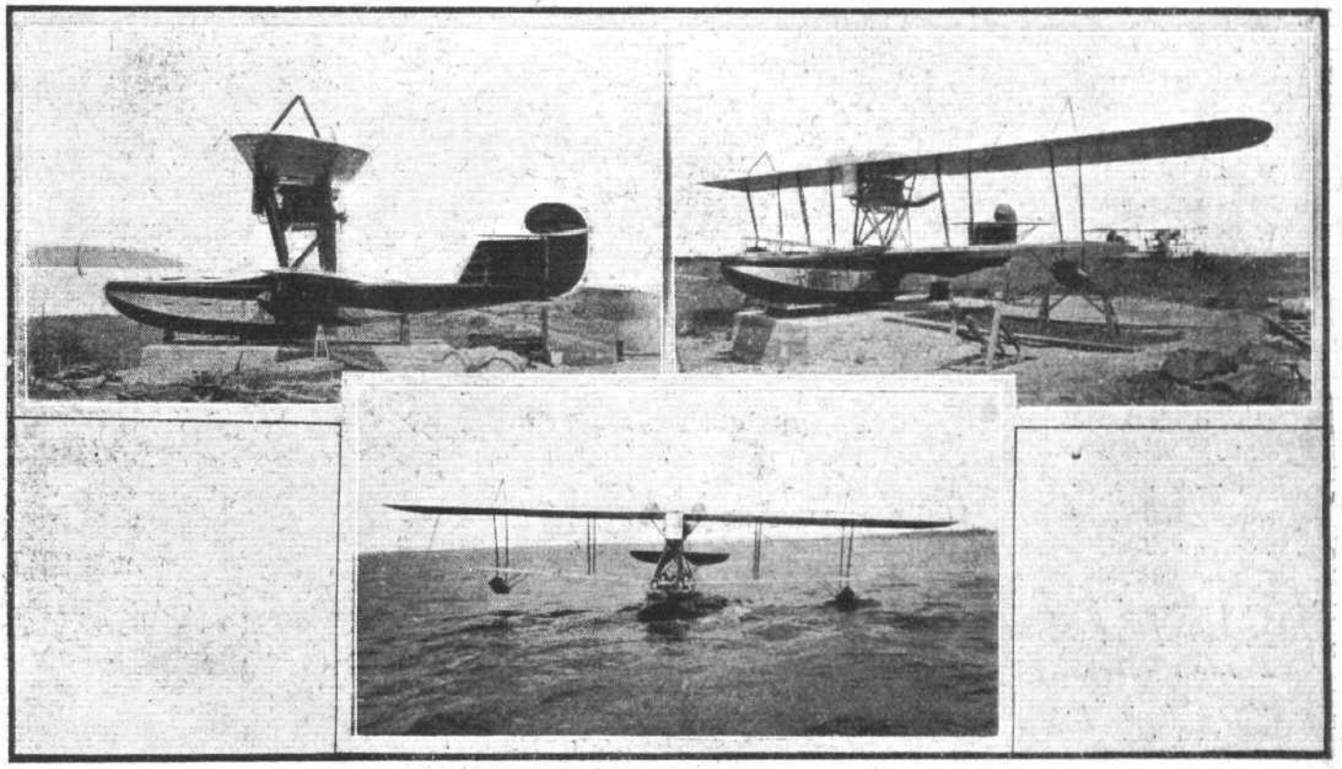
The Liberty motor, which is available in quantities in the United States, was decided upon for the power plant, and in accordance with these requirements a design was laid down for a biplane flying boat with a metal hull and tail surfaces and spruce and fabric wings. The upper wing was made with a larger span and chord than the lower in order to improve the aerodynamical efficiency of the structure and avoid damage in high seas. The ailerons were fitted to the upper wings only and were designed to be very large for control at low speed.

The comfort of the passengers in the hull was the first consideration. Seaworthiness, ease of take-off, and low air resistance were also given consideration. The hull, as laid down, is wide enough to accommodate four passengers abreast in the rear seat and three in the forward seat, a crew of two, with dual control, being located back of the passengers and directly forward of the lower front wing beam. The bottom has a V with an inclined angle of 152° at the step and the angle is still sharper at the bow. The step is 5 ins. deep and the bottom back of it raises up to an angle of 8° towards the stern and is V-shaped, ensuring clean running before take-off, and seaworthiness.

The wing tip pontoons are of very good streamline section, square in cross section, turned up on edge so as to break the force of the water in case of contact in high seas.

Details of Construction.—The wings are constructed of built-up trussed ribs and spruce I-beams, braced with internal bracings of hard wire; the upper wing is of three panels. The centre section panel, which supports the petrol tanks is rigidly mounted on the motor support. The outer panels are cut away for the ailerons, which are narrow and fitted to the upper wing only and extend two-thirds the total wing spread. The small balancing panels, mounted on duralumin masts, with general narrowness and straight ends, constitute a very light and effective lateral control. The aileron control cables are run in tubes inside the wing panels, which reduces air resistance and makes the controls readily removable. All air controls are mounted on ball bearings.

Seventeen S alloy is used for the framework of the tail surfaces. Channelled sections of 22 B. and S. gauge metal are employed for the wings and minor braces; 20 gauge material for the built-up boxed sections, and 18 gauge is used for the fin post, while 1/16th in. wall tubes are used for the rear beam of the stabiliser and for the elevator and rudder beams. All joints are riveted. The weight of this structure while much stronger than the usual wooden construction is but 53 lbs. per sq. ft. of area.



THE AEROMARINE METAL-HULL FLYING BOAT: Three views of the complete machine: Top, left, side view; right, three-quarter front view; and, below, front view of the machine in the water. It is fitted with a 400 h.p. Liberty engine.

As low maintenance was the first consideration, the power plant installation received very careful attention. The motor support is built up of heavy steel tubing with the exception of the motor-beds, which are of laminated spruce and ash. This support is attached to the hull, which affords a wide base. The whole structure requires no cable bracing whatsoever.

A cartridge tube radiator, swung from the upper panel and steadied from the engine bed, has a frontal area of 620 sq. ins. A full face shutter control, operated from the pilot's cockpit, regulates the air flow.

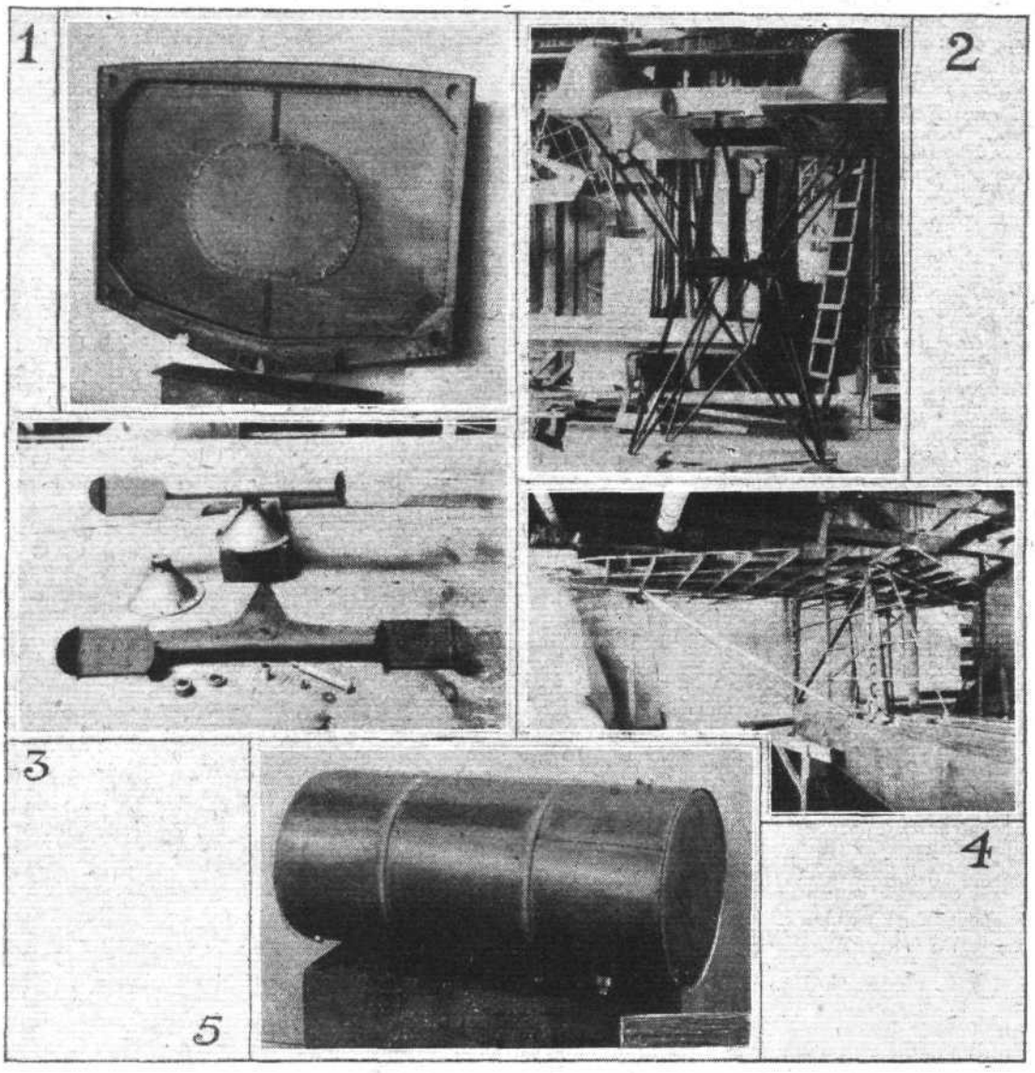
Two 50-gal. 3*s*. alloy welded petrol tanks mounted in the centre panel and one 70-gal. reserve tank in the hull constitute the petrol system, the 70-gal. tank being used for long flights only and is separated from the main system by a shut-off valve. A visible petrol gauge, located in the hull, shows the amount of fuel in the lower tank; separate gauges in the upper tanks indicate their condition. All three tanks weigh but 60 lbs. for a petrol capacity of 170 gals. One-inch 3*s*. alloy piping connects the tanks. The petrol is fed by gravity from the main tanks to the carburettor, which eliminates the head resistance of a fuel pump and assures reliability under all operating conditions.

The hull, which is the first all-metal hull to be constructed

in America, is the most interesting feature of this flying boat. The framework consists of 18 frames and five water-tight bulkheads and fore and aft stiffeners on deck and bottom ; all frames and stiffeners are made of the same size U-shaped sections ; fittings of metal varying from ·040 to 1/16th in., depending upon the place where used ; U-shaped sections pressed out of flat sheet, with flanges to which the covering is riveted on assembly. Thus, when the work is completed, no edges are left exposed, and the rounded back of the section is pleasing to the eye and practically immune from abrasion. Adherence to the same size of section greatly simplified the making of all joints between members, and incidentally saved lots of space in stock room. The bottom members of the frames (floors) are of box section, built up of two solid 17*s*. alloy webs and channel top, all riveted together. In one of our illustrations we show a typical frame in front of the step, at rear passengers' seat. In this case an additional cross member was required to support the seat, and from this member to the bottom the frame is covered with 17*s*. alloy sheet, forming a big storage space in the hull back of it.

The covering is of 3/64th in. thickness on sides and top of hull, and of 1/16th in. thickness on bottom ahead of step. The covering is riveted to the frames and stiffeners with 17*s*. alloy rivets. The chine, sponson clamp and deck clamp are made of 1/16th in. metal throughout, and are riveted over the covering. The bottom of the boat is quite smooth and clean, all stiffeners or keelsons being placed inside where they are protected from damage in handling of boat. This feature certainly will be appreciated by those who want the boat to give long and faithful service without annoying and costly repairs.

To protect the bottom further the heavy oak keel is provided. This keel is not a part of the structure, and can be quickly taken off and replaced when worn out. Strong metal keelson inside of boat is dependent solely to give required strength. Anxious as the designers were to get a lighter and better performing boat, they always remembered that service is paramount, and did not try to skim over any of the require-



Constructional Details of the Aeromarine Metal-Hull Flying Boat: 1. Bulkhead No. 17. 2. All-steel tubing engine mount with engine section panel, and two 50-gal. petrol tanks. Note absence of bracing wires. 3. Rudder bar and details. 4. Tail unit, uncovered. 5. Three-S. alloy welded petrol tank, 50 gals., 18.5 lbs.

ments derived from the practical commercial operation of Aeromarine flying boats.

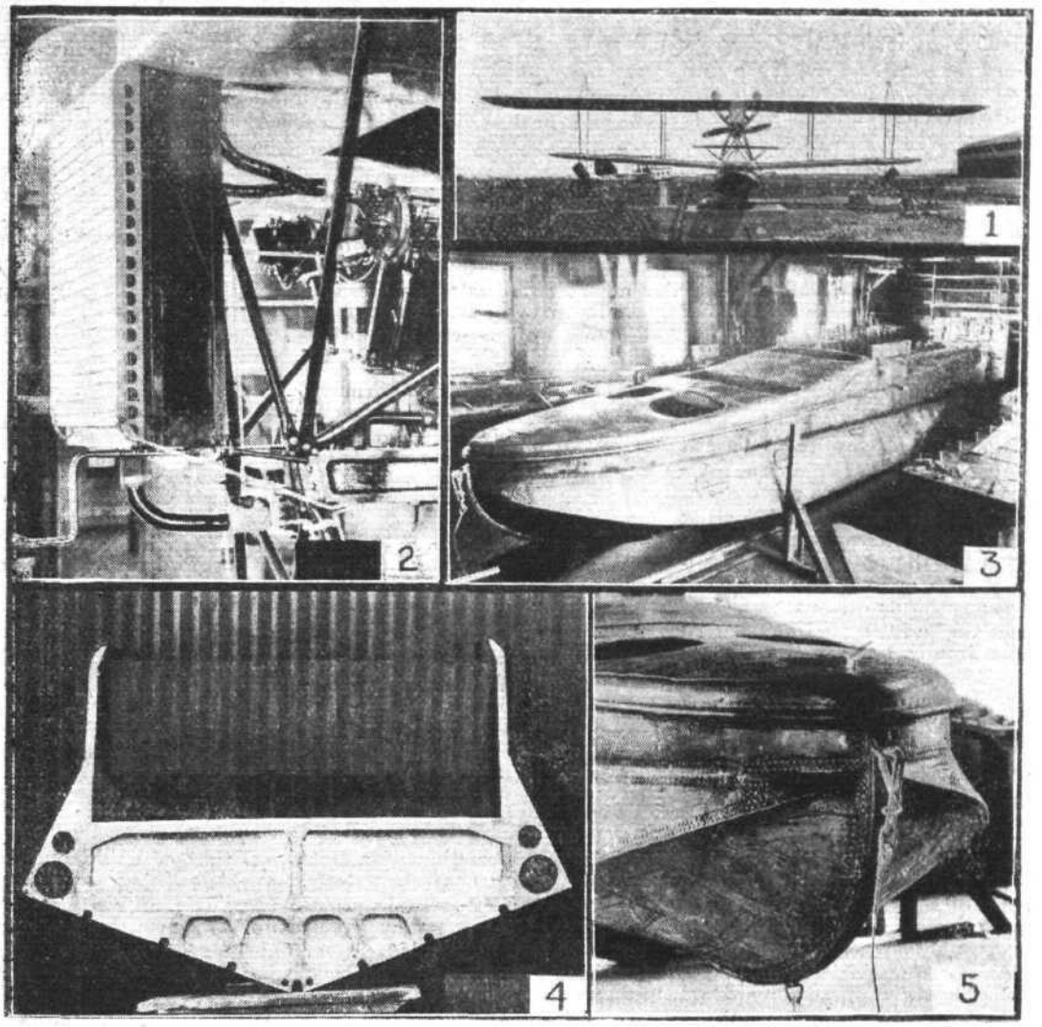
Performance.—Over 200 flights have been made in this ship with only two forced landings—one due to the clogging of carburettor jets, and the other to a faulty ignition switch ; in both cases the trouble was remedied without outside assistance, and the trip continued without delay.

Since this boat was launched on June 1 it has never been in a hangar. There was much criticism by the old boat builders on the thin metal used in the construction, the exposed rivet heads on the bottom, and the use of "aluminium" in salt water. The thin metal has justified itself in that there has been absolutely no leakage in the hull ; the rivet heads in the bottom have not caused any inconvenience in getting off ; in fact, this boat gets off in less time by several seconds than the old type boat under its best flying conditions, and the 17*s*. alloy has not corroded in salt water, although at times the whol surface of the bottom has been exposed to the action of the water. Immediately after launching the boat was put into operation, and on the third day a trip was made from Keyport to New York with company officials. Performance trials followed without the slightest mishap. Every day confidence in the boat was increasing. Up to the present time the boat has actually made more than 200 flights ; been in the water more than three months ; and flown a total of over 70 hours. The log of the boat shows that more than 800 passengers have been carried, exclusive of crew, and a distance of 4,800 miles has been covered ; all of this without the least bit of loss in performance due to water soakage or deterioration.

The specifications of the A.M.C. are as follows :—

General.—Type, flying boat, biplane ; purpose, commercial, passenger carrier ; number in crew, two (2) ; passenger capacity, for flights of 7 hours' duration, 5 ; for flights of 4 hours' duration or under, 7.

Dimensions.—Span, upper wing, 65 ft. ; span, lower wing, 48 ft. 6½ ins. ; length, overall, 32 ft. 10 ins. ; chord, upper wing, 7 ft. ; chord, lower wing, 5 ft. 1 in. ; angle of incidence, both



Some Details of the Aeromarine Metal-Hull Flying Boat: 1. Front view of the complete machine. 2. Radiator installation, attachment of motor support, and centre section strut. 3. The complete duralumin hull. 4. One of the transverse frames in hull, ahead of step. 5. The bow of hull.

wings, 4½°; dihedral, lower wing, 3°; wing curve, upper, Aeromarine No. 2; wing curve, lower, Aeromarine No. 6.

Areas.—Upper wing with ailerons, 434 sq. ft.; lower wing, 218 sq. ft.; total wing area, 652 sq. ft.; horizontal stabiliser, 53 sq. ft.; elevator, 35.5 sq. ft.; vertical fin, 21.5 sq. ft.; rudder, 21.6 sq. ft.

Weights.—Weight, fully loaded, 6,100 lbs.; weight, empty, with water, 3,660 lbs.; disposable load: five passengers 900 lbs.; crew of two, 360 lbs.; anchor and rope, 60 lbs.; miscellaneous equipment, 60 lbs.; fuel and oil, 1,060 lbs.; total disposable load, 2,440 lbs.; load per sq. ft., 9·35 lbs.; load per h.p., 15·25 lbs.

Performance.—High speed (1,700 r.p.m.), 98 m.p.h.; cruising speed (1,400 r.p.m.), 80 m.p.h.; min. flying speed (1,150 r.p.m.), 60 m.p.h.; landing speed (estimated), 50 m.p.h.; ceiling, absolute, 14,000 ft.; climb in 10 minutes, 3,300 ft.

Personals

Married

On November 17 Capt. V. A. ALBRECHT, the Manchester Regiment and R.A.F., eldest son of Mr. and Mrs. J. A. Albrecht, of Higher Broughton, Manchester, was married to JESSIE, youngest daughter of the late Mr. and Mrs. W. J. LOCKETT, of Grassendale, Liverpool.

To be Married

The engagement is announced between ARNOLD BEVAN (late R.F.C.), son of Mr. and Mrs. Bevan of Bournemouth, and MURIEL, only child of Mr. and Mrs. TROWBRIDGE ALLEN of Farmington, Conn., U.S.A.

The marriage arranged between ERIC THOMAS HAULTON ELLIS, late R.A.F., son of the late Major T. J. Ellis, I.A., and Mrs. Ellis, of Kasauli, Punjab, India, and MARGARET CAMPBELL HILL, youngest daughter of Mr. and Mrs. PERCY J. SHELDON, of Lymington, Hants, and Southwold, Suffolk, will take place, very quietly owing to family bereavement, at the Parish Church, Lymington, at 2 o'clock on Tuesday December 4.

The engagement is announced of Flight Lieut. HUGH MACLEOD FRASER, R.A.F., eldest son of the late Col. J. R. Fraser, C.M.G., and of Mrs. Fraser, of Bouverie Road, Folkestone, and HESTER, eldest daughter of the late Col. W. A. YOUNG and of Mrs. YOUNG, of Lockerley Manor, Romsey, Hampshire.

An engagement is announced between the Rev. SYDNEY NEVILLE VEITCH, of St. Maurice's, York (Hon. Major, R.A.F.), fourth son of the late John Hardinge Veitch, of Neville Court, Durham, and JOAN DOROTHY, second daughter of Mr. and Mrs. T. LIVINGSTONE BAILY, of 34, Glebe Road, Barnes.

The engagement is announced between Mr. F. P. RAYNHAM, of Elm Bank, Horsell, and Miss M. P. MACPHERSON, of Oaklands, Woking.

Item

His Majesty, the King of Sweden, attended by Count Levenhoupt and Monsieur Sandgren, honoured Sir Samuel and Lady Maud Hoare with his presence at dinner on November 6, at 18, Cadogan Gardens. The guests invited to meet His Majesty were: The Swedish Minister and Baroness Palmstierna, the Prime Minister and Mrs. Baldwin, the Duke and Duchess of Sutherland, Lord and Lady Edward Grosvenor, Colonel the Hon. Walter and Lady Evelyn Guinness, Colonel the Hon. Sidney and Lady Delia Peel, the First Lord of the Admiralty and Mrs. Amery, Air Chief-Marshal Sir Hugh and Lady Trenchard, and Mr. and Mrs. Oliver Hoare.

LIGHT 'PLANE AND GLIDER NOTES

ALTHOUGH the official rules governing the light 'plane competitions to be held next year have not yet been issued, it is understood that on one point at any rate a definite decision has been reached. This relates to the engine capacity, which has, we believe, been limited to 1,100 c.c. Some time ago we published in these columns the arguments for and against a larger engine capacity, and we arrived at the conclusion that 1,100 c.c. would be sufficient for the purpose of the competitions, even if it should be found desirable afterwards to increase the size of engine slightly so as to enable it to develop sufficient power when not in perfect tune, under conditions such as might be expected to be met with in the case of the private owner who is not an expert mechanic.

* * *

THERE are, however, a number of other points that still remain to be settled, and as designers are naturally anxious to be getting on with their drawings, but can only plan out their designs in very general terms, we would urge the necessity of the Air Ministry making an announcement without further delay. A complete statement of all the rules and regulations is not yet required, but sufficient of the nature of the competitions, and especially such items as tank capacity, single or dual control, minimum landing speeds, or other stipulations which will affect the design, should be intimated at once, so as to give the designers as much time as possible in which to plan and carry out their work. This year's competitions were announced rather too late, and in all fairness to competitors the main outline of the 1924 tests should be announced without a moment's delay.

* * *

FRANCE is losing no time in introducing her light 'planes abroad. Last week Lieut. Thoret left Paris for Prague with a Dewoitine "avionette" and two Dewoitine gliders in order to demonstrate these before the Czecho-Slovaks. Originally it was intended that Adjutant Descamps was to head the mission, but as he has resigned from the Service Technique in order to become chief pilot to Buscaylet-de-Monge, Lieut. Thoret was chosen in his place.

* * *

IN America the Farman representative, Mr. Wallace Kellett, has already got one of the Farman "Moustiques," with Anzani engine, and it is reported that he will endeavour to obtain some specimens of the latest Farman light 'planes with a view to placing them on the market in America.

* * *

BOTH these French firms are thus showing commendable enterprise in introducing French light 'planes abroad. How many of our constructors, we wonder, have sent, or are contemplating sending, samples of their light 'planes abroad, or even to the Dominions? Yet our machines are admitted by the French aviation press to be superior to the French.

AMATEUR CONSTRUCTION OF LIGHT AEROPLANES

Scheme Not Generally Favoured by Aircraft Firms

ONE of the results of the recent competitions at Lympne for light aeroplanes has been a very widespread interest in this latest type of aircraft, and one direction in which, among many others, this interest has manifested itself has been, as far as FLIGHT is concerned, that we have received, during the last few weeks, a very great number of enquiries from young men who are anxious to become owners and pilots of machines of this type. In most instances our correspondents have expressed a desire to save money by building the machines themselves, and at first sight such an undertaking might appear relatively simple. When one begins to go into detail, however, it is found that the suggestion is not without its difficulties. To begin with, any aeroplane, and the light 'plane is no exception to the rule, requires to be carefully designed, both as regards its aerodynamic characteristics and its structural details. This presupposes a very considerable degree of designing skill, and not only theoretical knowledge but long practical experience. It is realised at once that the average amateur cannot be assumed to possess these to the required degree. Then there is, moreover, the question of airworthiness certificates. If individual machines are to be "stressed" by Air Ministry experts—and a machine designed and built by an amateur would require this to a very much greater extent than does a machine designed and built by an experienced aircraft firm—the cost of obtaining such a certificate would naturally be rather high, and would add so much to the cost of building that any financial gain due to amateur construction might be practically nullified. Considering all these difficulties, one is forced to the conclusion that the amateur-designed and built light aeroplane is, in the majority of cases, out of the question. There might, of course, be isolated instances in which a man with aircraft experience and training might be in a position to design a perfectly sound machine, but such cases would certainly be relatively few.

The question then arises whether some other and simplified system could be adopted which would combine the lower cost of amateur construction with the skilled design of experienced aircraft engineers. The first solution to suggest itself is, naturally, whether it might be possible to follow the method employed—to a very great extent in America, and to a smaller degree in this country—in the building of small boats, known as the "knock-down" system. By this system the prospective amateur constructor is supplied, by firms making a speciality of "knock-down" boats, with all the necessary frames, timbers, planking, decking, keel, keelson, and even bolts and nuts, screws, rigging, paint and varnish, necessary for the building of the boat, all machined to size and ready to be erected, the "construction" carried out by the amateur boatbuilder being confined to putting the parts together—in other words, to "erecting" the boat. Now it will at once be seen that there is a very considerable difference between the amateur construction of a boat and that of an aeroplane. In the former case there is no great necessity for weight reduction. Consequently all the parts can be made amply strong for the work they have to do. In an aeroplane, and not least in a light 'plane, every ounce of weight counts, and it is not possible to make such wide allowances in the size and strength of components as in the case of a boat. In other words, in an aeroplane one cannot afford such high factors of safety as may be relied upon to make up for any small deficiencies in construction and erecting.

Let us examine briefly how the "knock-down" system might be expected to work when applied to amateur construction of light aeroplanes. It is often stated that the greatest single item of the cost of building an aeroplane is that of erecting. Now in the "knock-down" system this is precisely the function which it is intended the amateur should perform. Presumably, therefore, such a system might be expected to result in a not inconsiderable saving in the first cost of a machine, provided the amateur was willing to make up for this saving by his own personal efforts in constructing the machine. A further development, which appears to promise added interest and wider scope, is the formation of light 'plane clubs and associations, whose members would take a hand in the construction and would thus accumulate some considerable practical experience in aircraft work—a fact that might not be unimportant in developing that "air sense" which several of our leading personalities in air matters maintain is essential to the future development of aviation in the British Empire.

As we see the matter, the original design would be got out by an aircraft firm, who would build one or more machines and thoroughly test them out before placing them on the market. These machines would then be for sale complete in the ordinary way, but when they had become standardised a number of component parts would be manufactured and kept in stock. A set of clear instructions for assembling and erecting would then be prepared, illustrated by sketches and photographs to show the various stages, and a complete schedule got out, with numbered sketches of every part, and diagrams indicating their location and attachment in the machine. A customer would then receive these instructions, schedule, etc., with all the parts machined to size and cut to length, and his share of the work would consist in putting the parts together according to instructions. If machines were built of parts inspected and passed by the A.I.D., there should, presumably, be no difficulty in arranging with the Air Ministry for the certificate to be issued, provided an undertaking was given by the purchaser of the machine that no part in the structure had been replaced by one not passed by the A.I.D. In planning the original design the manufacturer would, of course, keep in mind that the machine was intended to be

assembled and erected by amateurs, and would design his details and scheme out his forms of construction accordingly. Metal fittings and wire bracing requiring trueing-up would, we take it, be eliminated as far as possible. Needless to say, all parts would be made on jigs so as to ensure accuracy and interchangeability.

This is the scheme in broad outline, and on the face of it there would appear to be no reason to suspect that it would not work satisfactorily in practice. As, however, we naturally cannot lay claim to the great practical experience possessed by "The Trade," we have communicated an outline of the scheme to a number of British aircraft firms for their "consideration and necessary action," as they say at the Air Ministry. We have had very interesting and concise replies from most of these firms, and the consensus of opinion seems to be that, although in theory the "knock-down" system has every appearance of being feasible and of offering a method of reducing the first cost of light 'planes, in practice the problem is less simple, and several objections exist. It is impossible for us to reproduce all the letters which we have received on the subject, but as in several instances the opinions expressed and the objections raised by various correspondents are almost identical, the general opinion of all may be fairly correctly indicated by quoting a few.

Here is a letter raising some of the more typical objections to the scheme :—

"While we absolutely agree with the view that many enthusiasts have sufficient money to buy the parts, but cannot afford to pay the cost of a complete machine, we are afraid that the objections to the scheme are insuperable. So much would depend on the skill and workshop equipment of the amateur concerned, that we feel we could not possibly take the responsibility for machines which had been assembled by an amateur. We think that you will agree that in the event of machines collapsing in the air—even though they had been assembled by the owner—a large amount of discredit would reflect upon the designers and manufacturers of the parts, and as the accident might easily be due to faulty assembly or to the substitution of unsuitable parts or details for some that may have been mislaid or damaged by the amateur constructor, we feel that the risk is one which we could not afford to run.

"In our opinion the only ways in which light aeroplanes can be made popular and available for the average owner-pilot are : (1) that the Government order sufficient quantities of these machines for training pilots to enable the cost to be reduced to a figure within the reach of the average amateur, and (2) the formation of amateur flying clubs."

Another letter on this subject raises the point of engine installation : "Regarding the question of erection, this depends to a great extent on the type of construction of the machine, as to what proportion the erection bears to the total work on the machine. For instance, a fuselage of ply-wood construction is hardly what one would call an amateur's job. On the other hand, if the fuselage were of the braced type, the manufacturing cost of the parts is probably greater. Then again, the question of engine installation is not so simple a matter unless the parts could be turned out in quantities and all completely interchangeable, so that the installation becomes purely and simply a matter of putting the parts together and requiring no technical knowledge other than the ability to follow the erection drawing. Before going too deeply into this point it seems to us it would be wise to obtain the attitude of the authorities concerning machines erected by amateurs. The question of airworthiness certificates is somewhat of an obstacle in the light 'plane question, and a clear idea of the procedure regarding these should be laid down so that prospective owners may realise what regulations are to be conformed with."

The airworthiness certificate problem is one which we have repeatedly urged the Air Ministry to pronounce upon at the earliest possible moment, and, needless to say, the problem would not tend to be made easier by the adoption of amateur erection of machines, even if made from "passed" components. Until, however, the authorities know whether or not constructors would be willing to undertake the marketing of parts for amateur assembly it is hardly likely that an official statement would be forthcoming.

One letter received agrees with the opinion that a large proportion of the cost of a machine is due to the cost of assembling and erecting, but states that it would be expensive to supply parts in small quantities. Thus the letter :—

"When aeroplanes are built in small quantities, it is by no means economical to manufacture spars, ribs, struts, longerons, etc., accurately to jig so that they may be assembled without skilled fitting. Therefore we think it would only be possible to design unfabriced components such as wings, fuselage, chassis, etc. In other words, we agree that a great deal of a machine's expense is due to the cost of assembling and erecting, but until machines are made in large quantities this assembling cannot be done by amateurs."

Slightly different points, but tending nevertheless to the same general conclusions as those reached by other correspondents, are raised in the following letter : "Probably (in the not distant future) the course suggested could be followed, but at present we think it would be wise to let aircraft designers get on the soundest possible lines in the construction of light aeroplanes before they are more generally put into civil or military purposes. Either one of two things could happen : (1) All parts would be jig drilled so that all the amateur has to do is to put in the bolts, as with a Meccano set. In such case we might as well assemble ourselves, as then the assembly work would *not* be the most expensive part of the work. (2) Details would have to be drilled and fitted on the job. This is where the danger comes in. An amateur would make a horrible mess of it, and we should have breakages in the air in every direction. Also there could be no adequate inspection of such work. Even if the erection were soundly carried out, the finish in most cases would probably be very bad and not such as we would care to subscribe our name to."

Finally, the following letter confirms nearly all the views previously expressed : "We feel that the time has not yet come for this method of aircraft construction, as the light aeroplane is really a large machine in miniature, calling not only for carefully selected parts, but extreme accuracy and skill in erection, the erection as important as the selection of material. The assembly of aeroplane parts and the final erection call for certain special training and skill, which the average amateur does not possess, and in the event of an accident occurring to a machine due to defective assembly, a certain amount of criticism would be made regarding the materials supplied."

From the foregoing contributions, which are representative of most of those received on the subject, it is evident that the aircraft industry is not generally in favour of amateur construction, even when such is reduced to the assembly of inspected and "passed" components. In case anyone should suspect "The Trade" of being influenced in this view by considerations of profits, we would point out that nothing could be farther from the actual facts. The aircraft industry is composed of as fine a set of sportsmen as one could ever wish to meet, and we claim without fear of contradiction that in no other industry does one find so many sincere enthusiasts, nor so much pioneer work being done, as in the aircraft trade. If the views of practically all the firms consulted coincide on the subject of amateur construction, it is because the industry is genuinely convinced that the scheme would be too risky. In any case, any suspicion that the negative attitude taken is connected with financial considerations is countered by the obvious fact that a manufacturer laying himself out to sell machined and finished components for construction of light 'planes would necessarily charge for these at such a rate as to remunerate himself for their manufacture, and would make his profits in this way, instead of on the sale of complete erected machines.

Certain of the objections raised by our correspondents would appear to be capable of being met, and there is still a possibility of a firm coming along with a suitable design and willing to manufacture the parts in accordance with the scheme outlined. Others, however, are incontrovertible—or seem to be at the present moment—and as the penalty exacted in case of structural failure due to some small defect is greater in an aeroplane than in, perhaps, any other means of locomotion, it is absolutely essential that every safeguard should be taken to ensure the structural strength and soundness of machines.

Perhaps the greatest objection—and one which none of our correspondents appear to have raised—is that of too early standardisation. At the present moment we have only just started with light aeroplanes, and really nobody knows what a light 'plane should be like. We have produced a number of very successful types, but he would be a bold man indeed who would dare to prophesy that the light 'plane of the next four or five years will be like those at present in existence, or even contemplated, and too early standardisation means, to a certain extent, stagnation in development, which is the last thing one wants at the present moment.

We have dealt with this subject at very considerable length, as it is one of some importance, and we would ask the many prospective owner-pilot-constructors who have written us on the matter to read carefully the opinions of the aviation industry, as exemplified in the letters quoted above, and to regard these as containing the considered views of the majority, at any rate for the present.

THE THERMO-DYNAMICS OF AIRCRAFT ENGINES

ON November 15 Mr. H. R. Ricardo read, before the Royal Aeronautical Society, a highly interesting paper on "The Thermo-Dynamics of Aircraft Engines." Mr. Ricardo's work on internal combustion engines is so well known as to need no introduction to readers of FLIGHT, and the paper, although not a very long one, contained in condensed form a very great deal of useful information, summarising as it did the chief thermo-dynamic problems connected with the development of the aero engine. We have, unfortunately, not the space to print the paper in full, but the following brief summary of the most important points may be of interest. For the full report of the paper and discussion readers are referred to the Society's *Journal*.

The biggest item of loss, Mr. Ricardo considered, was that due to change of specific heat. Next in importance came direct heat loss to the cylinder walls; next detonation, which limited the expansion—or, as it is more commonly called, the compression ratio—that could be usefully employed. Next came dissociation, and finally pre-burning. The first two were both directly dependent upon flame temperature, and the next two largely so. Anything that could be done to reduce flame temperature would be a direct gain, but, unfortunately, with all fuels except hydrogen a very high temperature was needed to promote combustion. Mr. Ricardo concluded that it would seem, therefore, that we must concentrate on trying to stratify the charge, and by so doing try, in effect, to mislead the mixture by allowing a high flame temperature at the start, but diluting it immediately afterwards. Pre-burning provoked detonation, and thus forced us to use a lower compression than we would otherwise like to use. He considered that hot exhaust valves were the principal, in fact almost the sole, cause of pre-burning. By using sleeve valves this cause could be eliminated almost entirely.

Regarding the use of water for the internal cooling of an engine the lecturer stated: "Later experiments showed that the desired end could be obtained and several incidental advantages secured in addition when about 5 per cent. to 10 per cent. of water was dissolved in the fuel. This had the effect of increasing the volumetric efficiency, and therefore the power output, by about 6 to 7 per cent. At the same time it cools thoroughly the exhaust valves and all internal parts. Also the lowering of the compression temperature and the presence of steam both tend to check detonation and permit of a much higher compression being used. The writer is convinced that this method of internal cooling is destined to prove of very great advantage to aero engines, particularly to air-cooled engines, for it permits of any compression ratio up to 7.0 : 1 or higher being used at ground level, while the internal cooling, the lower flame temperature, etc., all serve to keep the engine very much cooler. At the same time, owing to the greatly increased volumetric efficiency and the higher compression which can be used, the power output at ground level is increased by about 20 per cent. It is not proposed to use water in solution in the fuel under normal running conditions at altitude, but only as means of getting off the ground and attaining a height at which the engine can operate on petrol.

"Since water will not dissolve in petrol or benzole some mutual solvent must be found; of such acetone appears the most satisfactory, but methyl alcohol is nearly as good and has the advantage of being more readily available in war time, or alternatively a fuel of very high latent heat may be used, such as power methylated spirit, which already contains a large percentage of water in solution. Only a relatively small quantity of the water-bearing fuel need be carried, sufficient to lift the machine perhaps three times from the ground to, say, 6,000 ft., which in the case of fast scout machines would mean sufficient for about 15 minutes' flight. The slight extra weight of this fuel would be far more than compensated for by the much higher efficiency when running on petrol due to the higher compression which its use renders possible."

Referring to his previous paper before the R.Ae.S. on the use of a stratified charge, the lecturer continued: "Since that date a great deal of experimental work has been carried out along these lines, and with extremely encouraging results; by such means not only is it possible to work at much lower mean flame temperatures than would otherwise be practicable, but, applied to aircraft, the method has other peculiar advantages; for example, it does away with any necessity for altitude compensation, since as the density of the air falls and the carburettor tends to deliver a richer mixture, more and more of the excess air present in the stratified charge is consumed, with the result that the engine becomes self-compensating as regards carburation, and the power output falls directly as the flow of petrol, *i.e.*, as the square root only of the density, while at all times irregularities either of carburettor adjustment or of distribution are taken care of automatically, since, under all conditions of working, excess air is present to burn completely all the fuel. It has been found that while, with a homogeneous charge, the weakest mixture which can be used in the weakest cylinder must contain at least 82 per cent. of the fuel required for complete combustion and the average to a number of cylinders at least 90 per cent., corresponding to a flame temperature of approximately 2,360° C., and an efficiency relative to the air-cycle of about 69 per cent.; with a stratified charge it is possible to work with as little as 50 per cent. of the fuel required for complete combustion, corresponding to a mean flame temperature of only about 1,800° C. and a theoretical relative efficiency of somewhere about 78 per cent. Actually the flame temperature of a portion of the charge is initially much higher than 1,800° C., so that one cannot expect quite so high a relative efficiency, and in fact we have not yet succeeded in doing better than 75 per cent. of the air cycle, corresponding in the experimental unit we are now running to a consumption of 0·37 lb. of petrol per i.h.p., or 0·42 lb. per b.h.p. hour at any load between 60 per cent. and 85 per cent. maximum torque. Thus, with a stratified charge it is possible to obtain either about 60 per cent. full load torque at an exceedingly high efficiency and low heat flow, or full torque at normal efficiency and normal heat flow, or, of course, any range between these limits, but throughout all at an efficiency exceeding the highest obtainable with a homogeneous charge, and that regardless of inequalities of distribution, etc."

On the subject of super-charging, the lecturer offered what was, we believe, a novel suggestion that seems to promise further considerable improvement. After outlining briefly the merits and disadvantages of the exhaust-driven turbo blower, Mr. Ricardo said: "If we work with a stratified charge we can then supercharge to almost any extent. For we start with a very much lower mean flame temperature, and, even if we supercharge, to double the initial pressure, the gross heat flow to the cylinders need be little more than when running normally with a homogeneous charge, while apart from the heat flow we have the following advantages: (1) We have only the supplementary air to supply under pressure, instead of both the main charge and the supercharge, so that a much smaller blower will suffice. (2) We do not need to put the carburettor or any of the main pipe work under pressure, nor do we disturb its normal functioning in any way. (3) Since only a small proportion of the total cylinder charge is compressed, after-cooling is unnecessary.

"The whole problem becomes, therefore, very much simpler, but in the case of a poppet valve engine the admission of the stratified charge, whether it be at normal density or as a supercharge, involves the addition of supplementary valve gearing, which is a serious complication and prevents the system being applied to any existing aero engine. In the case of a sleeve valve engine, however, this is perfectly simple, for all that is needed are extra ports low down in the sleeve, which involve no additional complication."

In concluding his highly interesting paper Mr. Ricardo said: "It will be asked what is the outcome and what the practical application of all this theorising and speculation, and what after all is the ideal type of engine for aero work? The answer, I think, is that there are as many applications as there are designers, and that it is still too soon to define the ideal type of aero engine. We each have our own ideals, and if the writer had at this moment to design engines for aircraft he would, for the light fast scouting machines, go for an air-cooled radial engine with poppet valves, a very high compression, using dissolved water or a fuel of very high latent heat for getting off the ground, with possibly a little, but certainly only a very little, direct supercharging at high altitudes. For the heavier classes of machine he would, in the light of present knowledge, go for a water-cooled sleeve valve engine with stratified supercharge."

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"Water-cooled Aero Engines"

OWING to an error in the list of fixtures sent out by the Institute of Aeronautical Engineers, the date given for Mr. Rowledge's paper, under above title, was given as December 9. The date should be January 9, 1924, and the paper is being read before the Institute of Automobile Engineers (and not before the Institute of Aeronautical Engineers, as erroneously stated) at the Institute of Mechanical Engineers, at 6.30 p.m. Members of the I.Ae.E. are invited.

FLIGHT

THE ROYAL AIR FORCE

London Gazette, November 13, 1923

General Duties Branch

The following are granted permanent commissions in ranks stated (Nov. 14) :—*Flight Lieut.* W. S. Caster, M.C. *Flying Officers.*—R. E. M. Milne and J. Silvester.

Group Capt. Hon. J. D. Boyle, C.B.E., D.S.O., is placed on half-pay, Scale A ; Oct. 20. Flying Officer C. W. Busk, M.C., is placed on half-pay, Scale B ; Nov. 12. The following Flying Officers resign their short service commissions :—V. D. Smith ; Oct. 8. J. B. R. Windham (Capt., I.A., retd.) ; Nov. 14.

Stores Branch

Flying Officer J. P. Crichton is placed on retd. list on account of ill-health ; Nov. 14. Flight Lieut. A. R. Thomas is placed on half-pay, Scale B ; Nov. 6 (substituted for *Gazette*, Nov. 6).

Medical Branch

The following are granted permanent commns. in ranks stated (Nov. 14) :—*Squadron Leader* R. W. Ryan, M.B. *Flight Lieuts.*—E. C. K. H. Foreman, C. A. Lindup.

Reserve of Air Force Officers

Class A.—L. A. Lewis is granted a commn. in General Duties Branch as Flying Officer on probation ; Nov. 13. The commn. of Pilot Officer W. R. Hyde is terminated on cessation of duty ; Sept. 20.

The following officers are confirmed in rank (Oct. 20) :—*Flying Officers.*—P. A. A. Boss, F. T. Courtney, L. F. Mead, E. E. Owen, P. Phillips, D.F.C., C. A. Pike, B. C. Rice, M.C., E. G. Richardson, F. G. Saunders, M.C., J. Stanley, T. F. Steele, D. J. Stewart, S. E. Taylor, N. H. Thackrah, A. E. Ward, H. M. Yeatman. *Pilot Officers.*—W. Anderson, T. E. W. Browne, C. Bunch, J. R. Cox.

Memoranda

The permission granted to Sec. Lieut. A. E. J. Pratt to retain his rank is withdrawn on his enlistment ; Oct. 10.

London Gazette, November 16, 1923

General Duties Branch

Squadron Leader W. D. Long, O.B.E., is re-seconded for a further two years' duty with the Egyptian Government ; Jan. 1. Air Commodore L. E. O. Charlton, C.B., C.M.G., D.S.O., is placed on half-pay, scale B ; Nov. 20. Flight Lieut. B. J. W. Brady, D.S.M., is placed on half-pay, scale B ; Oct. 3.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commander A. V. Bettington, C.M.G., to British Legation, Buenos Ayres, for duty as Air Attaché. 27.10.23.

Squadron Leaders : A. Gray, M.C., to No. 12 Sqdn., Northolt. To command. 19.11.23. E. L. Tomkinson, D.S.O., A.F.C., to Marine and Armament Experimental Estab., Isle of Grain. 1.12.23. R. B. Maycock, O.B.E., to Air Ministry. 1.12.23. A. C. Winter, O.B.E., to No. 208 Sqdn., Egypt. 29.10.23.

Flight Lieutenants : D. Cloete, M.C., A.F.C., to No. 2 Flying Training Sch., Duxford. 19.11.23. R. E. Nicoll and M. B. Frew, D.S.O., M.C., A.F.C., both to No. 4 Flying Training Sch., Egypt. 14.10.23. G. H. Hall, A.F.C., to H.Q., Egypt. 14.10.23. G. E. Gibbs, M.C., to No. 1 Armoured Car Co., Palestine. 14.10.23.

Stores and Accountants Branch

Flight Lieutenants (Stores) : A. E. Sutton-Jones and F. R. Berresford, both to R.A.F. Depot (Non-effective Pool). 9.9.23, on transfer to Home Estab.

Flying Officer (Stores) C. E. Whinney, to Electrical and Wireless Sch., Flowerdown. 7.11.23.

Flight Lieutenants : J. Walker to H.Q., Iraq. 14.9.23. E. W. Crosbie to Aircraft Depot, Iraq. 14.9.23. P. J. Murphy to Aircraft Depot, Egypt. 23.9.23. R. A. Young to No. 24 Sqdn., Kenley. 6.11.23.

Flying Officer L. T. Sanderson, D.S.M., to Stores Depot, Iraq. 14.9.23.

Pilot Officers (Accountants) : C. G. Bull, C. W. Cackett, J. Charles, E. F. Coleman, W. R. Donkin, C. P. Puckridge, C. B. Rawlins, and F. C. Warner, all to H.Q. Coastal Area. 22.10.23, on appointment to Short Service Commns. for Course of Instruction.

Medical Branch

Flight Lieutenants : E. N. H. Gray, D.P.H., to No. 28 Sqdn., India. 14.10.23. E. A. Lumley, M.C., M.B., to No. 208 Sqdn., Egypt. 15.10.23. T. J. X. Canton, M.B., to No. 4 Flying Training Sch., Egypt. 15.10.23. C. T. O'Neill, O.B.E., M.B., to No. 216 Sqdn., Egypt. 22.10.23. J. R. Crolius, M.B., to Detention Hospital, Jerusalem. 19.10.23. J. A. Musgrave, D.P.H., and F. E. Johnson, both to Palestine General Hospital. 27.9.23. J. A. Quin, M.D., B.A., to Jenin Combined Hospital, Palestine. 16.10.23. J. D. Leathy, M.C., M.B., B.A., to No. 31 Sqdn., India. 14.10.23. W. B. Stott to R.A.F. Trans-Jordania, H.Q. 12.10.23.

Flight Lieutenants : C. A. E. I. Brownlee, M.B., to No. 4 Sqdn., S. Farnborough. 18.9.23. J. E. Cox, to Research Laboratory and Medical Officers Sch. of Instruction, Hampstead, on appointment to a Temporary Commission for short course of instruction. 5.11.23. C. A. Meaden, to H.Q., Coastal Area. 13.11.23. J. G. F. Heal, M.D., D.O.M. and S., to Baghdad Combined Hospital. 11.10.23.

Flying Officer V. S. Ewing, M.B., to Basrah Combined Hospital. 11.10.23.

Flying Officers (Q.Mstr.) : W. Gamblen, to Stores Depot, Iraq. 11.10.23. W. King, to Baghdad Combined Hospital, Iraq. 11.10.23.

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

THE SOARING FLIGHT QUESTION

[2078] I shall be obliged if you will allow me to amplify your report of my lecture.

An interesting question is : What is the nature of the apparently descending current at the stern of a steamer in which gulls can sometimes make steep upward glides ?

Supposing there is a head wind, then as the steamer moves ahead, it tends to leave a vacuum behind it which is filled up by air flowing over the deck of the steamer and descending over the stern. An air current also runs along each side of the ship which at the stern turns inwards. These two currents meeting each other may join, making an ascending current immediately abaft the stern. More commonly they seem to become mingled with the descending current from above. Pieces of paper let loose over the stern show a descending current. The possibility is suggested that pieces of paper let loose from port holes might be carried in the lateral currents and, in the mingled mass of currents at the stern, might rise in the close neighbourhood of pieces of paper liberated from the deck which were being carried downwards. However this may be, there is no doubt that the air abaft the stern is in a highly turbulent condition. Since in such air remarkable feats of soaring flight are observed, the phenomena give support to the view that soarability is due to turbulence.

A proof, perhaps more singular than conclusive, that the turbulent air at the stern is predominatingly descending is given by an observation of a slow motion picture of the Papyrus-Zev horse-race lately shown at the Tivoli Cinema. Just as with a steamer air currents must flow past the racing horse to fill up the vacuum left by its movement relatively to the air. In the slow motion picture the hairs of the tail of Papyrus near the base were continually almost vertically downwards. They showed an oscillation from the vertical direction of very limited extent. Near the middle of the tail the hairs were also directed downwards, but had oscillations of larger amplitude, thus proving the presence of turbulent motion in the predominatingly descending air. At the tip of the tail the hairs kept changing in direction from directly backwards to backwards and upwards. This last movement corresponds to the upward current that exists at the stern of the steamer aft of the descending current. In the case of Zev the hairs of the tail were tied up for the race, rendering it easier to see the up and down movement of the body of the tail that occurred with each stride. Assuming that the slow down was 10 times, the strides were being made at the rate of about five per second. The range of up and down movement of the body of the tail was at least a foot. Consequently the tail was being moved up and down at the rate of at least 10 ft. per second. If one were to tie horse hairs on to a stick and wave it up and down at this rate, the hairs, owing to air resistance, would constantly trail behind. Since in the slow motion picture there was no trailing behind, but the hairs were continuously directed downwards, we may conclude that their downward direction was not due to their weight, but to their being in a downward current of considerably more than 10 ft. per second.

E. H. HANKIN

"Jimmy" James Joins Smith's

BRITISH aviation records, "Jimmy" James, and Smith's aero instruments have always gone hand in hand, so it is not surprising to learn that "Jimmy" has just joined the staff of S. Smith and Sons (M.A.), Ltd., of Cricklewood. J. H. J. is going to take charge of the growing and successful aviation instrument section of the House of Smith, and we feel pretty certain that this branch is going to benefit considerably as a result—not only from the business point of view, but probably on the technical side as well, for if anybody knows what is wanted in the way of "gadgets" Jimmy should. Here's every success to J. H. J. + S. S. S.

Aero Golfing Society

Results of Autumn Meeting at St. George's Hill, November 1.

AUTUMN CHALLENGE CUP (presented by Cellon (Richmond), Ltd.).—H. Burroughes, 86 less 9 = 77.

FOUR BALL MEDAL FOURSOMES (Prizes presented by Sir Henry White Smith).—Major R. H. Mayo and Lieut.-Col. W. A. Bristow, 83 less 10½ = 72½.

By DOUGLAS B. ARMSTRONG

Danziger Air Stamps

A NEW series of air post stamps hailing from the Free Port of Danzig has been shown us by Mr. W. E. Hughes. Issued on or about October 19, it comprises four denominations, uniform as to design and colour, two of which have already had their face values raised by surcharging in consequence of the headlong fall of the German mark. The vignette, executed in small oblong format, consists of a posthorn, the loop of which encloses a picture of an aeroplane in flight. Printed in bright vermilion, and with the usual inscriptions, "Freie Stadt Danzig—Flugpost," the respective values are 250,000, 500,000, 2,000,000 on 100,000, and 5,000,000 on 50,000 mark.

This constitutes the fourth issue of special stamps for use in the air mail service made by the Free State since September 29, 1920, when on the inauguration of the Copenhagen-Hamburg-Amsterdam-London air line certain German stamps earmarked for provisional service in Danzig were additionally impressed with distinctive devices to denote air postage. On the 40 and 60 pfennig values the special overprint took the form of a biplane (in outline), whilst the 1 mk. bore the insignia of a winged posthorn. One sheet of the 60-40 pfennig stamp was issued inadvertently with a double impression of the surcharge.

At this time the postal aeroplanes did not actually call at Danzig, so that air post letters were forwarded by rail to Berlin, and thence by air to destination. Air post stamps of a definitive type, in five denominations, were brought into use on June 1, 1921, in connection with the Berlin-Danzig-Konigsberg-Memel service established on April 1 of that year. The design, representing a Taube plane encircling the tower of the Marian Church, is the work of a local artist named Bucholtz, the stamps themselves being surface-printed by the Danzig firm of Julius Sauer on paper watermarked with hexagons and perforated 14. The highest value, 5 mk., comes, however, in large traverse oblong format, and with a zig-zag roulette in lieu of perforation. It is also known imperforate. The values and colours of this series are: 40 pfg., green; 60 pfg., deep violet; 1 mk., rose; 2 mk., brown; and 5 mk., ultramarine. To these was added on May 10, 1922, a 10 mk. stamp, printed in deep green in the type of the 5 mk., which also exists imperforate.

These stamps, with the addition of a 100 mk. denomination printed in scarlet, appeared in February, 1923, in new shades and on paper having a webbing-patterned watermark; whilst in May last the same designs were adapted for five new values made necessary by increased rates for air postage due to the decline of the mark, viz.: 25 mk., pale blue; 50 mk., orange; 250 mk., sepia; and 500 mk., crimson. Such is the record of the air post stamps of Danzig to date.

Air Stamps at Auction

A "FLOWN" Hawker cover in good state of preservation realised £32 at a recent London stamp auction, and a letter franked with an Alcock Trans-Atlantic stamp, but with a London receiving mark in July, 1919, sold for £21.

Readers are invited to forward to the Editor of FLIGHT *letters, etc., bearing aerial stamps or postmarks for mention in this column, as well as out-of-the-way varieties, etc.*

We shall also be pleased to hear from correspondents interested in air-stamp collecting, and to answer any queries.

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A Solex Again

WE understand from Messrs. S. Wolf and Co., Ltd., that the Nieuport Delage (Hispano-Suiza) which, piloted by Sadi Lecointe, created a new world's altitude record of 10,722 m., was equipped wich a Solex carburettor. Bearing in mind that in an event of this kind the carburettor plays a very important part, being the lung, as it were, of the engine, the Solex can claim a fair share of the glory.

SOCIETY OF MODEL AERONAUTICAL ENGINEERS

FULL particulars and entry forms for the aviation section of the *Model Engineer* Exhibition, which opens on January 4, are now available, and all who desire to enter should apply early, either to the Editor, *Model Engineer*, or to the Competition Secretary, S.M.A.E., 21, Lanercost Road, Tulse Hill, S.W. 2.

The aviation section of the Exhibition is divided into five sections, four competitions and a loan section. The competitions are as follows: (1) For flying models, all models to undergo a practical test before the Exhibition; (2) For scale models; (3) For flying models capable of full size adaptation, and undergoing a practical test before the Exhibition; (4) For any type of flying model made by a junior, *i.e.*, by a competitor who was still at school and under 17 on July 1, 1923.

Silver cups and other awards are offered for each of these classes.

Once again, apply early. This year will undoubtedly see a record entry, and space will be limited. The closing date for entries is December 15, and all flying tests should be carried out before that date. It is not advisable, considering the weather, to leave these things until the last minute, but to those who cannot arrange for earlier tests, there will be a special rally on Parliament Hill Fields at 11 a.m. on Sunday, December 9. Full details of this important meeting are being sent out to all members this week. *All* who are interested in model aviation, whether members of the S.M.A.E. or not, should be present on this occasion, if possible with a model.

C. BAYARD TURNER, Competition Secretary

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PUBLICATIONS RECEIVED

Aeronautical Research Committee, Reports and Memoranda :—

No. 843 (M.18). The Constitution of Some Alloys of Aluminium with Copper and Nickel. By K. E. Bingham and J. L. Haughton. December, 1922. Price 2*s.* net.

No. 846 (Ae. 89). The Lateral Stability of S.E.5a in Gliding Flight. By E. F. Relf. August, 1922. Price 9*d.* net.

No. 847 (Ae. 90). The No. 2 7-ft. Wind Channel at the Royal Aircraft Establishment. November, 1922. Price 4*d.* net.

No. 848 (Ae. 91). Rolling and Yawing Moments due to Roll of Model AVRO Wings. By F. B. Bradfield and O. E. Simmonds. November, 1922. Price 1*s.* net.

No. 849 (Ae. 92). The Effect upon the Control of an Aeroplane of Carrying Load Distributed Along the Planes. November, 1922. Price 3*d.* net.

No. 851 (Ae. 93). The Comparison of the Manœuvrability of Aeroplanes by the Use of a Cinematograph Camera. By H. A. Francis. December, 1922. Price 1*s.* net.

No. 853 (F.4). Note on Temperature Measurements. By F. M. Green and W. S. Renwick. November, 1922. Price 1*d.* net.

No. 870 (Ae. 106). Full Scale Determination of the Characteristics of a Variable Pitch Airscrew. By F. W. Meredith. March, 1923. Price 6*d.* net. London: H.M. Stationery Office, Kingsway, W.C. 2.

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AERONAUTICAL PATENT SPECIFICATIONS

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1922

Published November 15, 1923

19,794. J. D. NORTH. Metal aircraft structures. (205,569.)

APPLIED FOR IN 1923

Published November 15, 1923

11,323. Soc. ANON. DES ATELIERS D'AVIATION L. BREGUET. Slow-speed and safety device for multiple engine combination. (196,927.)

FLIGHT

The Aircraft Engineer and Airships

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